



COMPARATIVE STUDY OF THE PHYSICOCHEMICAL PROFILE OF *THEVETIA PERUVIANA* AND *RICINUS COMMUNIS* SEEDS

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Introduction

Seeds have nutritive and caloric values which make them necessary in diet. (Odeomelam, 2005). Africa, indeed the most tropical and sub-tropical, countries are blessed with numerous seeds and nuts, many of which are yet to be fully used due to insufficient information on their

Abstract

This paper assessed the comparative study of the physicochemical profile of yellow oleander and castor oil seeds. The fruits were air dried, cracked to remove the seed; the seeds were pound in a mortar and pestle into paste (cake) in order to weaken or rupture the kernel walls. Fluid from the paste were squeezed out and packaged in airtight sample plastics and stored in the refrigerator at 4 °C prior to laboratory analysis. The physicochemical properties such as iodine value, moisture content, saponification value, acid value, viscosity, specific gravity and refractive index were determined. At the end of the analysis, Iodine value obtained for both yellow oleander and castor oil seed samples were found to be 94gl²/100g and

86gl²/100g respectively and both values fall within the acceptable AOCS limit. The moisture content in both yellow oleander and Castor oil seed samples were found to be 0.52% and 0.35% respectively. Statistical analysis showed no significant differences ($P \leq 0.005$) among the values obtained. The saponification value obtained for yellow oleander and Castor oil seed samples were found to be 193mgKOH/g and 180mgKOH/g respectively and are within the range specified by AOCS. There were significant differences ($p \leq 0.05$) among the values obtained. The acid value obtained for both yellow oleander and Castor oil seed samples were found to be 18.46mgKOH/g and 12.66mgKOH/g respectively. Statistical analysis showed significant differences ($P \leq 0.05$) among the values obtained. The value for castor oil exceeds the AOCS limit of 2.0 mgKOH/g. Kinematic viscosity obtained were 7.8mm²/s and 6.9mm²/s for yellow oleander and Castor oil respectively. These are within the range specified by AOCS. Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained. Refractive index measured was found to be 1.469 and 1.468 for yellow oleander and castor oil respectively. These are within the range specified by AOCS. Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained. Specific gravity measured was found to be 0.925 and 0.9166 for yellow oleander and castor oil respectively. These are within the range specified by AOCS. Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained. The physicochemical profile of the seed samples investigated contains presence of some valuable minerals which suggest that they can be used for industrial purposes such as soap and oil as biodiesel.

Keywords: Comparative Study, Physicochemical Profile, *Thevetia peruviana*, *Ricinus communis*, Seeds.

Chemical, biological and industrial importance. One of such seed-bearing plants is *Thevetia peruviana* commonly known as lucky-nut or milk-bush. *Thevetia peruviana* belongs to Apocynaceae family; Thevetia Genus. The plant is commonly known as yellow oleander, lucky-nut, be- still tree and milk bush. (Ibiyemi *et al*, 2002).

Thevetia peruviana is used medicinally throughout the tropics in spite of its toxicity. In Côte d'Ivoire and Benin the leaf sap is used as eye drops and nose drops to cure violent headaches; the seeds may be used as a purgative. The seed oil is applied externally in India to treat skin infection. In southern Africa and Cameroon the seeds are used as an arrow or ordeal poison. Other reports state the use of the seeds as an abortifacient. The seeds act as a contact poison; mashed with a soap solution they are used as an insecticide. In Ghana and Uganda the wood is used to make tool handles and building poles (Vandana and Varsha 2014). It is also used as fuel. The fruit pulp is sometimes eaten. *Thevetia peruviana* is widely planted as an ornamental in gardens, and also as a hedge. In cooler climates it can be grown in tubs in the glasshouse and outdoors in summer. It is a plant toxin insecticide for termites.

Thevetia peruviana inhibited spermatogenesis in rats, indicating the possibility of developing a herbal male contraceptive. (Gupta *et al.*, 2011). Omolara and Samuel (2007) noted that yellow oleander (*Thevetia peruviana*) tree is largely available in North-East India, and is widespread in American, Asian and African continents. A yellow oleander tree can produce about 400–800 fruits all the year round depending on the climatic conditions and age of the plant, the fruits are usually green in colour and become black on ripening. Each fruit contains one to four seeds in its kernel; the oil content of the seed is about (60–65%) which makes it a naturally suitable source of renewable non-edible oil (Omolara and Samuel, 2007). Studies such as

Adebowale *et al.*, (2012) Yarkasuwa *et al.*, (2013) and Betiku and Ajala, (2014) have examined its use for biodiesel production.

Ricinus communis is a species that belongs to the Euphorbiaceae family and it is commonly known as castor oil plant, and Palma christi. Castor oil is possibly the plant oil industry's most underappreciated asset. It is one of the most versatile of plant oils, being used in over ten diverse industries. Castor oil has long been used commercially as a highly renewable resource for the chemical industry (Ogunniyi, 2006; Mutlu and Meier, 2010). It is a vegetable oil obtained by pressing the seeds of the castor oil plant (*Ricinus communis* L.) that is mainly cultivated in Africa, South America, and India. Thomas (2000) and Hong and Blackmore, (2015) reported that major castor oil-producing countries include Brazil, China, and India. This oil is known to have been domesticated in Eastern Africa and was introduced to China from India approximately 1,400 years ago. Hong and Blackmore (2015) stated that India is a net exporter of castor oil, accounting for over 90% of castor oil exports, while the United States, European Union, and China are the major importers, accounting for 84% of imported castor oil (Mckeen *et al.*, (2016).

India is known as the world leader in castor seed and oil production and leads the international castor oil trade. Castor oil production in this country usually fluctuates between 250,000 and 350,000 tons per year. Approximately 86% of castor seed production in India is concentrated in Gujarat, followed by Andhra Pradesh and Rajasthan. Specifically, the regions of Mehsana, Banaskantha, and Saurashtra/Kutch in Gujarat and the districts of Nalgonda and Mahboobnagar of Andhra Pradesh are the major areas of castor oil production in India. Shrirame *et al.*, (2011) note that the economic success of castor crops in Gujarat in the 1980s and thereafter can be attributed to a combination of a good breeding program, a good extension model, coupled with access to well-developed national and international markets (Tewari, 2012).

Castor (*Ricinus communis*) is one of the oldest cultivated crops; however, it contributes to only 0.15% of the vegetable oil produced in the world. The oil produced from this crop is considered to be of importance to the global specialty chemical industry because it is the only commercial source of a hydroxylated fatty acid (Tewari, 2012). Even though castor oil accounts for only 0.15% of the world production of vegetable oils, worldwide consumption of this commodity has increased more than 50% during the past 25 years, rising from approximately 400,000 tons in 1985 to 610,000 tons in 2010 ((Tewari, 2012 and Scholz and Silva, 2008). On average, worldwide consumption of castor oil increased at a rate of 7.32 thousand tons per year. In general, the current rate of castor oil production is not considered sufficient to meet the anticipated increase in demand.

In Nigeria, there is no available statistics suggesting the level of production, but experts observed that the plant grows well in the Northwestern states of Yobe, Borno, Adamawa, and Gombe, because of their Sahelian weather and prolong dry season. Although many scholars have contributed immensely on *Thevetia peruviana* and *Ricinus communis* seeds, little or no interest of government and inadequate empowerment fund has discouraged Nigerians farmers to planting these plants. Nigeria spends between four to six hundred million dollars annually importing *Ricinus communis* oil despite the abundant land, ecological and climatic conditions which are favourable to *Ricinus communis* production. Improvement program on local accessions of *Ricinus communis* are being carried out at the National Cereals Research Institute (NCRI), Badeggi and other research centers across the country. Through the improvement programs, different accessions are introduced for trials. Since oil is the economic yield of *Thevetia peruviana* and *Ricinus communis*, there is a need to identify accessions with good physical and chemical qualities oil.

The main objective of the research was to determine the physicochemical profile of *Thevetia peruviana* and *Ricinus communis* seeds. Specific objectives are: (a) to ascertain the physicochemical properties of *Thevetia peruviana* and *Ricinus communis* seeds. (b) to compare the physicochemical properties of *Thevetia peruviana* and *Ricinus communis* seeds. (c) to ascertain if these seeds have minerals for industrial production of soap and oil for biodiesel.

MATERIALS AND METHODS

Sample Collection and Preparation

Seeds of *Thevetia peruviana* (yellow oleander) and *Ricinus communis* (castor plant) were collected from Abara Okporo, Orlu Local Government Area, Imo State, Nigeria. The seeds collected were manually cleaned by removing foreign materials such as ticks, stains, sand and dirt. The dried seeds were mechanically dehauled to remove the seed coat. The dehauled seeds were further dried at 50°C for 72 hours to improve the efficiency of extraction.

All reagents and solvents used were of analytical grade.

Preparation of Solutions

1% v/v phosphoric acid solution:

1% v/v phosphoric acid solution was prepared by transferring 1cm³ from stock into 100cm³ volumetric flask with distilled water and then making up to the mark. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 1M sodium hydroxide solution:

1M of sodium hydroxide solution was prepared by dissolving 40g of sodium hydroxide pellet in a 200cm³ beaker containing distilled water. The solution was then transferred into 1000cm³ volumetric flask and then made to the mark with distilled water. The solution was

standardized against 1M aqueous sulphuric acid. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 1M Sulphuric Acid solution:

This was prepared by pipetting 56cm³ of 18M concentrated acid in a fume cupboard and transferring into a 1000cm³ volumetric flask containing about 400cm³ distilled water. The dilution of Sulphuric acid is exothermic so addition of the acid to distilled water was done slowly. The solution was then made up to mark with distilled water. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 0.1 M Potassium Hydroxide solution:

This was prepared by weighing 5.6g of Potassium Hydroxide pellets into a 1000cm³ beaker containing about 500cm³ of distilled water. It was stirred until it dissolves and transferred quantitatively into a 1000cm³ volumetric flask. The solution was then made up to mark with distilled water. The solution was standardized against 1M aqueous Sulphuric acid. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 0.8% w/w Sodium Hydroxide solution:

This was prepared by weighing 0.8g of Potassium Hydroxide pellets and dissolving in 90.2g of distilled water in a 100cm³ beaker. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 10% Potassium Iodide solution:

This was prepared by weighing 10g of Potassium Iodide pellets and dissolving in 60cm³ of distilled water in a 100cm³ beaker. The solution was transferred into a 100cm³ volumetric flask and made to the mark with distilled water. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 0.1M Sodium Thiosulphate solution:

This was prepared by dissolving 24.818g of Sodium Thiosulphate Pentahydrate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) into a 100cm^3 beaker containing 60cm^3 of freshly boiled water with continuous stirring. Sodium Carbonate (0.2g) was added as a preservative to the solution. The solution was transferred into a 100cm^3 volumetric flask and made up to mark with distilled water. The solution was then kept for an hour and standardized against Potassium Dichromate using starch as an indicator. The prepared solution was transferred into a clean, dry storage bottle and label.

Preparation of 0.1M Hydrochloric Acid solution:

This was prepared by pipetting 4.23cm^3 of 36.5% Hydrochloric Acid into a 500cm^3 volumetric flask containing distilled water. The solution was made up to the mark. The prepared solution was then transferred into a clean, dry storage bottle and label.

Extraction:

The fruits were air dried, cracked to remove the seed; the seeds were pounded in a mortar and pestle into paste (cake) in order to weaken or rupture the kernel walls. Fluid from the paste were squeezed out and packaged in airtight sample plastics and stored in the refrigerator at 4°C prior to laboratory analysis.

Test Methods for Physicochemical Properties

Iodine value (Wijs Method):

Oil sample (0.2g) was weighed into a 250 cm^3 conical flask. 10 cm^3 of chloroform was then added to dissolve the oil by swirling. Wijs (20 cm^3) solution was added and stoppered immediately and swirled. The mixture was allowed to stand in the dark for 30 minutes. 10% Potassium Iodide (KI) (15 cm^3) solution and 100 cm^3 of distilled water were added

to the mixture. The mixture was swirled again and titrated against a solution of Sodium Thiosulphate using starch indicator, until the blue colour completely disappear. The blank titration was also carried out without oil sample. Iodine Value was calculated using equation:

$$\text{Iodine Value} = \frac{(B - S \times N \times 12.69)}{W}$$

Where B = titre value for blank, S = titre value for the sample, N = Normality of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ (Sodium Thiosulphate solution) and W = weight of the sample.

Moisture content:

Moisture content was determined using Centrifugal method. In this method, 100 cm³ of biodiesel sample was centrifuged at a relative centrifugal force of 800 ref for 10 minutes at 32°C in a centrifuge tube readable to 0.005 cm³ and measured to 0.01 cm³. After centrifugation, the volume of water which settled into the tip of the centrifuge tube was read to the nearest 0.005 cm³ and reported as the volumetric percent water by centrifuge.

Saponification value:

The oil (1g) was weighed and transferred into a round bottomed flask. 20 cm³ of 0.5 N alcoholic KOH solutions was added to the round bottomed flask. The above procedure without taking oil for blank titration was performed. Both round bottomed flasks was allowed to cool. Both the samples were titrated using 0.5 N HCl with Phenolphthalein indicator. The disappearance of pink indicates the end point. Saponification value was calculated using equation:

$$\text{Saponification value} = \frac{(T_b - T_s) \times N \times 56.1}{W}$$

Where T_b = Titre value of blank in cm^3

T_s = Titre value of sample in cm^3

N = Normality of KOH

W = weight of oil and

56.1 = Equivalent weight of KOH.

Acid value

AOAC 940.28 (1990) / AOCS official method Ca5a-40 (1997) was used as reference. 1.5g of the sample was weighed in a clean dried 250 cm^3 conical flask, and 50 cm^3 of Propan-2-ol was added to ensure complete dissolution. 5 drops of Phenolphthalein indicator was added and mix thoroughly. The mixture was then titrated against 0.1 M KOH to a faint pink colour end point. The acid value was calculated using equation:

$$\text{Acid value} \frac{(\text{mgKOH})}{(\text{g})} = \frac{56.1 (V \times C)}{W}$$

Where V = Volume of KOH,

C = Molar concentration of KOH and

W = Weight of oil.

Kinematic viscosity:

Kinematic viscosity is a measure of resistance to flow of a liquid due to internal friction of one part of the fluid moving over another. A viscometer was inserted into a water bath at the test temperature (30°C) and left for 30 minutes. The sample was added to the viscometer and allowed to remain in the bath as long as it reached the test temperature. The sample was allowed to flow freely and the time required for the meniscus to pass from the first to the second timing

mark was taken using a stop watch. The procedure was repeated a number of times and the average value taken were then multiplied with the viscometer calibration to give the kinematic viscosity.

Refractive index:

This was determined with the aid of a refractometer. Precaution was made to make certain the prism of the refractometer was clean and completely dry. 5 drops of the sample was placed on the prism of the refractometer. The prism was closed and tightened firmly with a screw head. It was allowed to stand for 3 minutes so that the sample reaches the temperature of the instrument. The instrument and light were adjusted to obtain the most distinct reading possible and then the refractive index was determined. Several readings were taken and the average computed.

Density/API gravity measurement:

The density bottle was used in determining the specific gravity of the samples. A clean and dry bottle of 25 cm³ capacity was weighed (W_0) and then filled with the sample, stoppered inserted and reweighed to give (W_1). The sample was substituted with water after washing and drying the bottle and weighed to give (W_2). The specific gravity of the sample was calculated using equation:

$$\text{Specific gravity} = \frac{W_1 - W_0}{W_2 - W_0}$$

Where $W_1 - W_0$ represent the mass of sample, and $W_2 - W_0$ stand mass for an equal volume of water.

Statistical analysis:

The data obtained for physicochemical parameters was subjected to one way Anova using Minitab 17.

RESULT

Result of Phytochemical Properties of Yellow oleander and Castor oil Seeds:

Samples obtained from yellow oleander and castor oil seeds were characterized to determine their physiochemical properties such as iodine value, moisture content, saponification value, acid value, kinematic viscosity, specific gravity, refractive index and percentage oil. The results obtained on these properties were compared with that of American Oil Chemists' Society (AOCS) standard values and the results obtained presented in Table 1.

Table 1: Result of physicochemical properties of castor and yellow oleander oils and comparison with AOCS standard values.

Parameters	Units	Obtained Experimental Value of <i>Thevetia peruviana</i> (Yellow oleander) Seed Extract	AOCS Standard Value of <i>Thevetia peruviana</i> (Yellow oleander)	Obtained Experimental Value of <i>Ricinus communis</i> (Castor oil) Seed Extract	AOCS Standard Value of <i>Ricinus communis</i> (Castor oil)
Iodine value	gl ₂ /100g oil	94	84-96	86	83-88
Moisture content	%	0.52	0.488 Max	0.35	0.355 Max
Saponification	mgKOH/g	193	186-194	180	176-184
Acid value	mgKOH/g	18.46	1.0- 28.4	12.66	2.0 max
Kinematic viscosity at 30°C	mm ² /s	7.8	6.8-7.4	6.9	6.3-8.9
Density/Specific gravity at 30°C	-	0.925	0.912-0.916	0.9166	0.88-0.915
Refractive index at 30°C	-	1.469	1.467-1.470	1.468	1.467-1.470
Percentage oil	%	69		51	

DISCUSSION

Physiochemical Properties of Yellow oleander and Castor oils:

Iodine value obtained for both yellow oleander and castor oil seed samples were found to be $94\text{gI}^2/100\text{g}$ and $86\text{gI}^2/100\text{g}$ respectively and both values fall within the acceptable AOCS limit. The iodine value shows the level of unsaturation of the seed samples (oils) and also influences the oxidation and deposition formed in diesel engines. It is used in determining the drying property of the oil present in the seed samples. The iodine value of yellow oleander seed sample ($94\text{gI}^2/100\text{g}$) was found to be higher than that of Castor oil seed sample ($86\text{gI}^2/100\text{g}$). This indicates that yellow oleander seed sample (oil) has a higher degree of unsaturation than castor oil seed sample, although, both oils are classified as non-drying oils since their iodine value is below $115\text{gI}^2/100\text{g}$ (Abdulkareem *et al.*, 2011).

Low iodine value indicates lesser number of unsaturated bonds and lower susceptibility of such oil to oxidative rancidity. Seed oils with iodine values less than $100\text{ml}^2/\text{g}$ are known as non-drying oils, above $100\text{ml}^2/\text{g}$ but less than $130\text{ml}^2/\text{g}$ as semi drying oils while above $130\text{ml}^2/\text{g}$ as drying oils. Non-drying oils are not suitable for ink and paint production due to their non-drying characteristics but may be useful in the manufacture of soaps and can be regarded as liquid oil (Aremu, 2006).

Oils with high iodine value are useful as raw materials in the manufacture of vegetable oil-based ice cream (Eze, 2012). On this basis, the oils obtained from the aril and pod can be classified as non-drying while that of the seed can be classified as semi-drying (Tsado *et al.*, (2018).

The moisture content in both yellow oleander and Castor oil seed samples were found to be 0.52% and 0.35% respectively. Moisture in vegetable oil is a great impediment to the formation of esters due to increase in tendency of soap formation and thus will have to be

minimal for transesterification to occur. The result from this study shows that moisture content from both yellow oleander and Castor oil seed samples are within the range specified by AOCS. Statistical analysis showed no significant differences ($P \leq 0.005$) among the values obtained.

The saponification value of seed oil is a measure of its oxidation during storage and also indicates deterioration of the oils. High saponification value is an indication of the presence of fatty acids with higher number of carbon atoms. It provides information on the average molecular weight and hence, chain length of a lipid (Ardabili *et al.*, 2011). High saponification values of the aril, seed and pod oils suggest that they will be suitable for soap making (Tsado *et al.*, (2018).

The saponification value obtained for yellow oleander and Castor oil seed samples were found to be 193mgKOH/g and 180mgKOH/g respectively and are within the range specified by AOCS. There were significant differences ($p \leq 0.05$) among the values but they are lower than the 223.7 mgKOH/g reported for *Nigrescens* by Ogbuanu *et al.*, (2015). A study by Afolayan *et al.*, (2014) reported 155.68 mgKOH/g for moringa seed oil which was low. The values are however, closer to the 175.78 mgKOH/g for groundnut seed oil reported by Musa *et al.*, (2012) and 193.00 mgKOH/g for *Jatropha curcas* seed oil reported by Elizabeth *et al.*, (2012).

The saponification value of oil is a measure of the tendency of the oil to form soap during the transesterification reaction. The saponification value of yellow oleander seed sample was found to be higher than that of Castor oil seed sample. This indicates that oil in the seed sample of yellow oleander has a higher tendency of forming soap during transesterification reaction than castor oil.

Acid value measures the percentage content of free fatty acids in a given amount of oil. It also provides information on the extent of the decomposition of triglycerides in the oil by lipase action into free fatty

acids and other physical factors such as light and heat. It depends on the degree of rancidity which is used as a measure of freshness (Ochigbo and Paiko (2011)).

The acid value obtained for both yellow oleander and Castor oil seed samples were found to be 18.46mgKOH/g and 12.66mgKOH/g respectively. Statistical analysis showed significant differences ($P \leq 0.05$) among the values obtained. The value for castor oil exceeds the AOCS limit of 2.0 mgKOH/g. Leung and Guo (2006) reported that oil present in seeds with high acid value tend to deactivate catalyst used during transesterification. The acid value of yellow oleander (18.46mgKOH/g) was seen to be exceedingly higher than that of castor oil (12.66mgKOH/g) and this signifies that the ester yield of yellow oleander is expected to be less than that of Castor oil due to increased catalyst deactivation and soap formation. Onuekwusi *et al.*, (2014) reported a higher value of 66.09 ± 0.01 mg KOH/g for unripe *Blighia sapida* seed. In contrast, Tsado *et al.*, (2018) obtained lower acid value of 4.91 ± 0.16 , 9.02 ± 0.34 and 6.03 ± 0.21 mg KOH/g for the aril, seed and pod oils of *Blighia sapida* respectively. They are closer to the 4.77, 9.36 and 5.99 mg KOH/g reported by Olaofe *et al.*, (2012) for white and yellow cultivars of melon seed oil and groundnut oil respectively.

Kinematic viscosity which is a measure of the flow capabilities of the oil present in seed samples was measured and found to be 7.8mm²/s and 6.9mm²/s for yellow oleander and Castor oil respectively. These are within the range specified by AOCS. However, Castor oil with the lower viscosity has higher flow capability than yellow oleander and can easily undergo transesterification (Abdulkareem *et al.*, 2012). Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained.

Refractometer was used to determine the refractive index. Refractive index measured was found to be 1.469 and 1.468 for yellow oleander and castor oil respectively. These are within the range specified by

AOCS. Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained. This is line with the findings of Tsado *et al.*, (2018). They reported that aril, seed and pod oil extracts has refractive index values of 1.46 ± 0.25 , 1.48 ± 0.41 and 1.45 ± 0.12 respectively and there were no significant differences ($P \geq 0.05$) among them. These values are low in comparison with the 1.558 reported by Oderinde *et al.*, (2008) for *Blighia unijugata* aril oil but close to the 1.465 reported for *Sterculia setegera* by Kyari (2008).

Specific gravity is an index of its density or weight per unit volume. The specific gravity (SG) of a liquid fuel is the ratio of a given volume of the fuel at a stated temperature to the weight of an equal volume of fresh water, also at a stated temperature. It is usual to quote specific gravities at either 15°C or 60°F for both liquids, i.e. 15°C/15°C or 60/60°F. Density is the mass per unit volume of a substance expressed in units such as gram per cubic centimeter (g/cm^3) for solids, gram per milliliter (g/ml) for liquids and gram per litre (g/l) for gases. In practice however, there is little numerical difference between density and specific gravity, so that, for all practical purposes, they can be regarded as synonymous (Clark 1988). From the study, specific gravity measured was found to be 0.925 and 0.9166 for yellow oleander and castor oil respectively. These are within the range specified by AOCS. Statistical analysis showed no significant differences ($P \leq 0.05$) among the values obtained. This is in line with the findings of Tsado *et al.*, (2008). They observed that the specific gravity of aril, seed and pod were 0.91 ± 0.57 , 0.96 ± 0.01 and $0.85 \pm 0.02 \text{ g/cm}^3$ respectively. There were no significant differences ($P \geq 0.05$) among the samples but they are comparable to the 0.85 g/cm^3 reported for ackee seed oil by Omosuli (2013) and 0.956 g/cm^3 reported by Oyeleke (2013) for ackee aril oil. Angaye and Maduelosi (2015) obtained a lower value of 0.795 g/cm^3 for gino oil. The specific gravities of the three oil show that they are less dense than water.

Conclusion

The study indicates that seed samples of *Thevetia peruviana* (yellow oleander) and *Ricinus communis* (castor oil) contains iodine value, saponification, acid value, moisture content, kinematic viscosity, refractive index and density/specific gravity. The physicochemical profile of the seed samples investigated contains presence of some valuable minerals which suggest that they can be used for industrial purposes such as soap and oil as biodiesel.

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APPENDIX



Plate 1: Yellow oleander (*Thevetia* plant).



Plate 2: Castor plant (*Ricinus communis*).